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| 10/594,253 | 09/25/2006 | Shinji Inagaki | 296761US0PCT | 7399 |

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| EXAMINER |
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BOHATY, ANDREW K

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| ART UNIT | PAPER NUMBER |
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1794

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| NOTIFICATION DATE | DELIVERY MODE |
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10/16/2009

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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|------------------------------|--------------------------------------|---------------------------------------|--|
| Office Action Summary | Application No. 10/594,253 | Applicant(s) INAGAKI ET AL. | |
| | Examiner Andrew K. Bohaty | Art Unit 1794 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 September 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 16-18 is/are pending in the application.
- 4a) Of the above claim(s) 15, 19 and 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 16-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

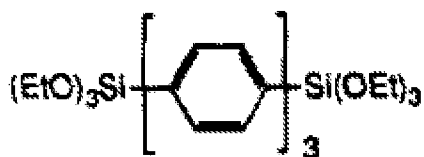
- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2006/9/25; 2006/11/13</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Claims 15, 19, and 20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected group and species, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on September 17, 2009.

2. Applicant's election with traverse of claims 1-14 and 16-18 in the reply filed on September 17, 2009 is acknowledged. The traversal is on the ground(s) that the Office did not consider the contribution of each invention as a whole and did not give reasons or examples to support the conclusion that the species are patentably distinct. This is not found persuasive because the applicants did not argue the merits of why the lack of unity of invention was not met. Further Shea et al. (J. Am. Chem. Soc. 1992, 114, 6700-6710) (hereafter "Shea") discloses a siloxane polymer made from the following



monomer, (page 6701, left column scheme at the bottom of the column and scheme 1) which reads on formula (1) in claim 1, where X is benzene (an applicants' preferred fluorescent molecule that can be excited by light), R¹ is ethoxy, n is 3 and m is 2. This demonstrates that the special technical feature of a siloxane, where X is a fluorescent molecule that can be excited by light was known in the prior art; therefore, inventions lack a special technical feature. Regarding the species restriction, the species have mutually exclusive characteristics, such as being a

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film or a particle and the applicants have not indicated that the species are not obvious variants of each other. Also in order to search for claim 15, the search query would have to be change to include the words "particle(s) sphere(s) spherical" and the use of different search queries constitutes a search burden.

3. The requirement is still deemed proper and is therefore made FINAL.

Drawings

4. The drawings are objected to because in Fig. 25, 26, 33, 36, 57-59, 99, 111, and 113 the figures are faded and some of the lines are missing. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and

informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

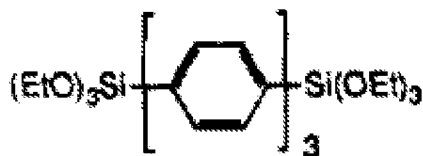
5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Shea et al. (J. Am. Chem. Soc. 1992, 114, 6700-6710) (hereafter "Shea").

7. Regarding claims 1-3, Shea discloses a siloxane polymer made from the



following monomer,

, (page 6701, left column scheme at

the bottom of the column and scheme 1) which reads on formula (1) in claim 1, where X is benzene (an applicants' preferred fluorescent molecule that can be excited by light), R¹ is ethoxy (claim 2), n is 3 and m is 2 (claim 3).

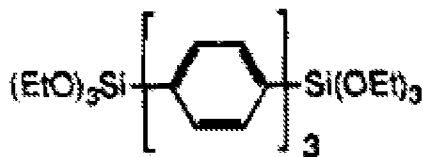
8. Regarding claim 4, although Shea does not specifically disclose wherein the difference in energy between the ground state and any of a singles excited state and a triplet excited is 40 to 140 kcal/mol the siloxane polymer from above inherently has this property. Also, the above siloxane polymer/monomer is a preferred example of the applicants which contain this property.

9. Regarding claim 5, Shea discloses the siloxane polymer using the above monomer has a structure with a regular spaced array (page 6701, left column, paragraph 3, Figure 1B). Since the monomer is a benzene ring the period would be less than 5 nm, because benzene has a length smaller than 5 nm.

10. Regarding claim 6 and 7, Shea discloses that siloxane polymer is porous and the mean pore diameter is 2.4 nm (page 6703 Table I, example X-1-A, page 6702 right column paragraph 4).

11. Claims 1-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989").

12. Regarding claims 1-3, Shea 1989 discloses a siloxane polymer made from the



following monomer, (573 left column, scheme in the middle of the page, paragraph 1, compounds 3a and 3z) which reads on formula (1) in claim 1, where X is benzene (an applicants' preferred fluorescent molecule that can be excited by light), R¹ is ethoxy (claim 2), n is 3 and m is 2 (claim 3).

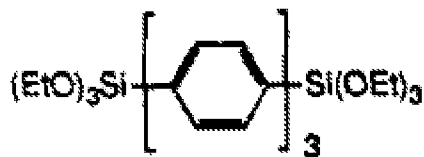
13. Regarding claim 4, although Shea 1989 does not specifically disclose wherein the difference in energy between the ground state and any of a singles excited state and a triplet excited is 40 to 140 kcal/mol the siloxane polymer from above inherently has this property. Also, the above siloxane polymer/monomer is a preferred example of the applicants which contain this property.

14. Regarding claim 5, Shea 1989 discloses the siloxane polymer (page 573 compound 3z) using the above monomer has a structure with a regular spaced array by introduction of the organic spacer (benzene molecule) (page 572, right column paragraph 2, Figure 2). Since the monomer is a benzene ring the period would be less than 5 nm, because benzene has a length smaller than 5 nm.

15. Regarding claim 6 and 7, Shea 1989 discloses that siloxane polymer is porous and the mean pore diameter is 2 nm or smaller (573 right column, paragraph 1).

16. Claims 1-4, 6-7 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Fan et al. (US 2003/0039744) (hereafter "Fan").

17. Regarding claims 1-3, Fan teaches a siloxane polymer made from the following



monomer, , (paragraph [0131], Fig. 3) which reads on formula (1) in claim 1, where X is benzene (an applicants' preferred fluorescent molecule that can be excited by light), R¹ is ethoxy (claim 2), n is 3 and m is 2 (claim 3).

18. Regarding claim 4, although Fan does not specifically disclose wherein the difference in energy between the ground state and any of a singlet excited state and a triplet excited is 40 to 140 kcal/mol the siloxane polymer from above inherently has this property. Also, the above siloxane polymer/monomer is a preferred example of the applicants which contain this property.

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19. Regarding claim 6 and 7, Fan discloses that siloxane polymer is porous and the pore diameter is 1.7 nm – 2.4 nm (paragraph [0136]).

20. Regarding claim 16, Fan discloses the siloxane polymer can be made in a thin film (paragraphs [0132] and [0133]) and further discloses that a thin film is a film with a thickness in the range of 50 nm to 1 μ m (paragraph [0060]).

Claim Rejections - 35 USC § 103

21. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

22. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

23. Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") as applied to claims 1-7 above, and further in view of Bartl et al. (Chem. Commun. 2002, 2474-2475) (hereafter "Bartl").

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24. Regarding claims 8-14, Shea 1989 does not teach wherein the porous siloxane polymer comprises another luminescent compound, where that compound is phosphorescent and the compound is “adsorbed on”, “bonded to”, “filled in” or “mixed with” the polymer, and wherein the siloxane polymer with the additional luminescent compound further comprises a surfactant. Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

25. Bartl teaches the encapsulation of rare earth material complexes in sol-gel derived composites (page 2474 left column paragraph 1). Bartl teaches the sol-gel derived composites include mesoporous silica and these materials are used for there optical properties (page 2472 left column paragraph 2). Bartl teaches the rare earth metals compounds to be Eu and Tb containing (page 2474 left column 2 paragraph), which are well known phosphorescent compounds (claims 11 and 14). Bartl teaches that when the phosphorescent rare earth metal complexes are mixed with the siloxane polymer and the polymer made further comprises a surfactant (P123) (claims 9, 10 and 13) (page 2474 left column paragraph 3). Bartl further teaches that the light emitted from the mesoporous structure is more pure that light emitted from sol-gels that do not have the mesoporous structure (page 2475 left column last paragraph).

26. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymer of Shea 1989, so when the polymer was made the synthesis included a surfactant and a rare earth metal compound (phosphorescent material) was included, so the resulting polymer contained an additional phosphorescent compound mixed with the polymer and the polymer further

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comprised a surfactant. The motivation would have been to make a siloxane polymer structure that emits light with a higher purity. Both Shea 1989 and Bartl teach the use of their sol-gels for use in optics, while Bartl teaches the incorporation of phosphorescent materials in to the sol-gel network and that mesoporous structure displays better light purity than other mesoporous structures.

27. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") as applied to claims 1-7 above, and further in view of Matthews et al. (Chem. Mater. 1993, 5, 1697-1700) (hereafter "Matthews").

28. Regarding claims 12-14, Shea 1989 does not teach a siloxane polymer further comprising a fluorescent compound, wherein the fluorescent compound is phosphorescent and the compound is "adsorbed on", "bonded to", "filled in" or "mixed with" the polymer. Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

29. Matthews teaches a sol-gel (siloxane polymer) that contains a Eu complex (although not taught by Matthews, Eu complex are known to be phosphorescent) mixed with the polymer (page 1698, right column paragraph 3) (claims 13 and 14). Matthews teaches the doped sol-gel produce red color and have high efficiency and can be used as optical sources (page 1700 entire page).

30. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify to siloxane polymer of Shea 1989 to include the Eu to

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provide a siloxane polymer with an additional phosphorescent material mixed with the siloxane polymer. The motivation would have been to produce a siloxane polymer that emits red light and can be used as an optical source.

31. Claim 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") as applied to claims 1-7 above, and further in view of Ogawa (J. Am. Chem. Soc. 1994, 116, 7941-7942) (hereafter "Ogawa").

32. Shea 1989 does not teach wherein the siloxane polymer is a layered material of stacked nanosheets, where each layer having a thickness of 10 nm or less. Shea 1989 does teach the use of the siloxane polymers in optics (page 574 left column paragraph 2).

33. Ogawa teaches the synthesis of siloxane polymers that are in a layered structure, where each layer has a thickness of 1 nm (page 7942 left column paragraph 2 Figure 3). Ogawa teaches films are highly transparent in the wavelengths of 220 to 2000 nm (page 7942 right column paragraph 3).

34. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymers of Shea 1989, so siloxane polymer was in a stacked structure of nanosheets, where the thickness of each layer was 1 nm. The motivation would have been to form a film that was highly transparent in the wavelengths of 220 to 2000 nm.

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35. Claim 18 rejected under 35 U.S.C. 103(a) as being unpatentable over Shea et al. (Chem. Mater. 1989, 1, 572-574) (hereafter "Shea 1989") as applied to claims 1-7 above, and further in view of Mashita et al. (JP 2000-306669) (wherein machine translation is used as English equivalent) (hereafter "Mashita") and Corriu et al. (Chem. Commun. 1996, 1845-1846) (hereafter "Corriu").

36. Regarding claim 18, Shea 1989 does not teach wherein the siloxane polymer further comprises an electric charge transporting material.

37. Mashita teaches a sol-gel (siloxane polymer) comprising a luminescent material and an electron transporting material (paragraph [0067]). Mashita teaches the use of the sol-gel in electroluminescent devices (paragraph [0011]). Mashita teaches the mixed sol-gel proved an electroluminescence device that is very efficient and long lifetime (paragraph [0009]).

38. Corriu teaches the use of bridged siloxane polymers can be used in light emitting diodes (page 1845 left column first three paragraphs).

39. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the siloxane polymer of Shea 1989 to include an electron transporting material in the polymer and use the material in an electroluminescent device. Mashita teaches the use of sol-gel in electroluminescent devices, while Corriu teaches that bridged siloxane polymers could be used in light emitting devices and Shea 1989 teaches the use of bridged siloxane polymers comprising of that benzene molecule as the bridging component. The motivation would have been to produce a

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siloxane polymer that could be used in a light emitting device and be very efficient and have a long lifetime.

Conclusion

40. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew K. Bohaty whose telephone number is (571)270-1148. The examiner can normally be reached on Monday through Thursday 7:30 am to 5:00 pm EST and every other Friday from 7:30 am to 4 pm EST.

41. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571)272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

42. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. K. B./
Andrew K. Bohaty
Patent Examiner, Art Unit 1794

/D. Lawrence Tarazano/
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